

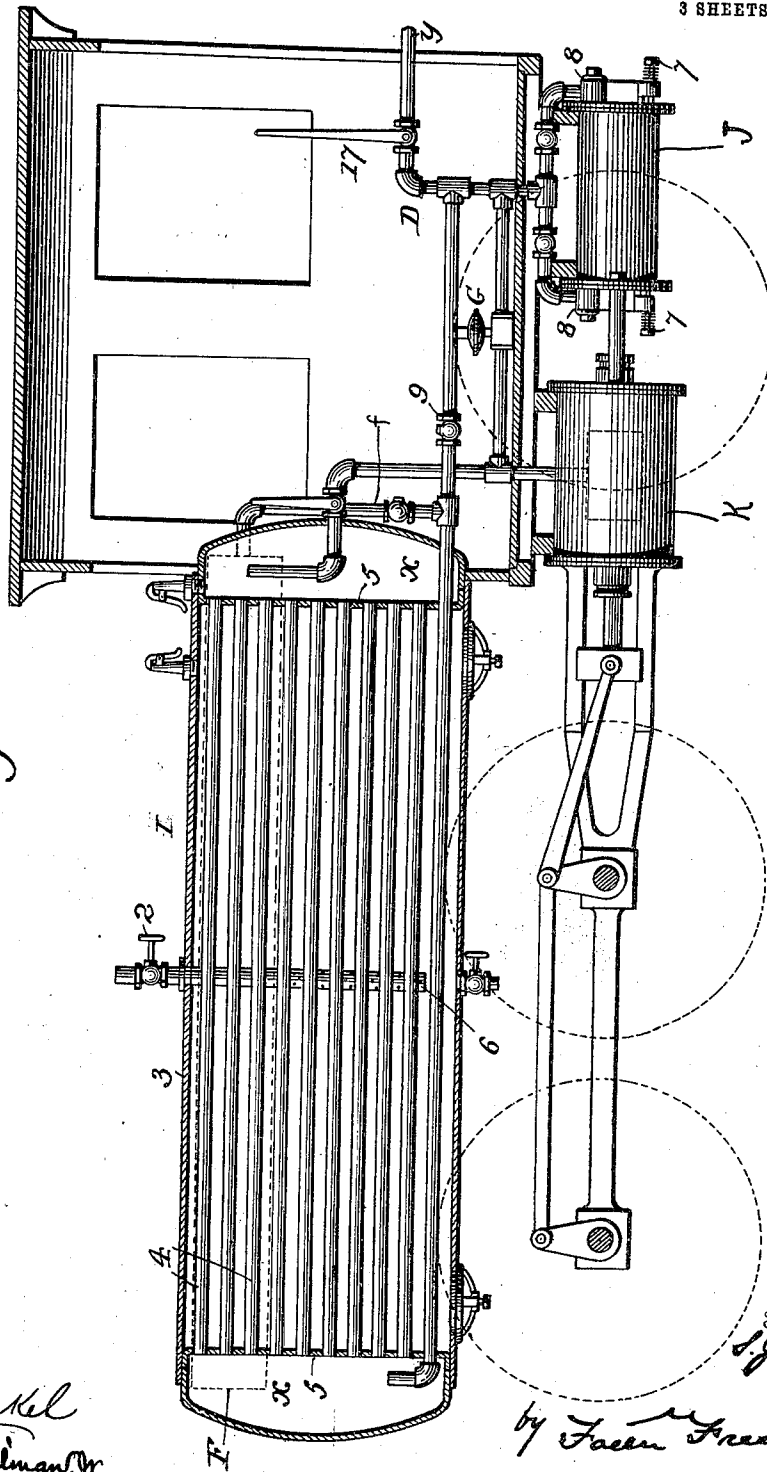
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S. J. WEBB.
HOT AIR LOCOMOTIVE.
APPLICATION FILED JAN. 23, 1902.

Patented July 11, 1911.

3 SHEETS-SHEET 1.

Fig. 1.



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Fig. 2

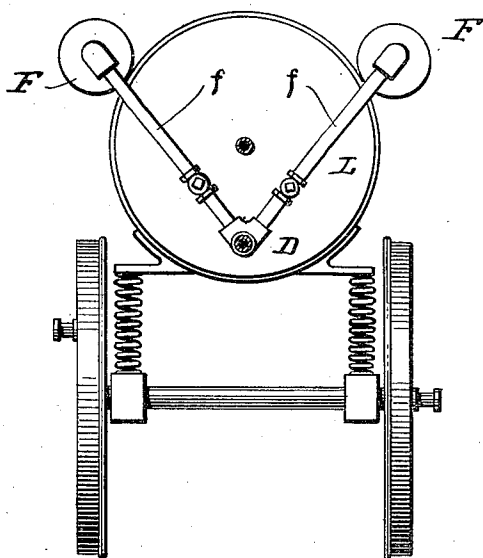
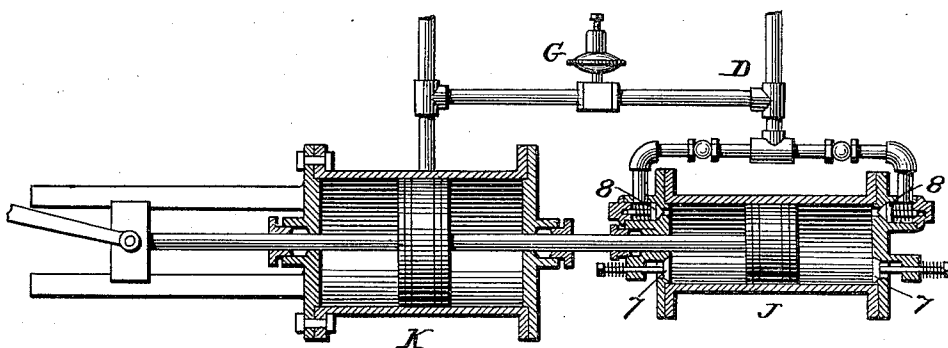


Fig. 3.



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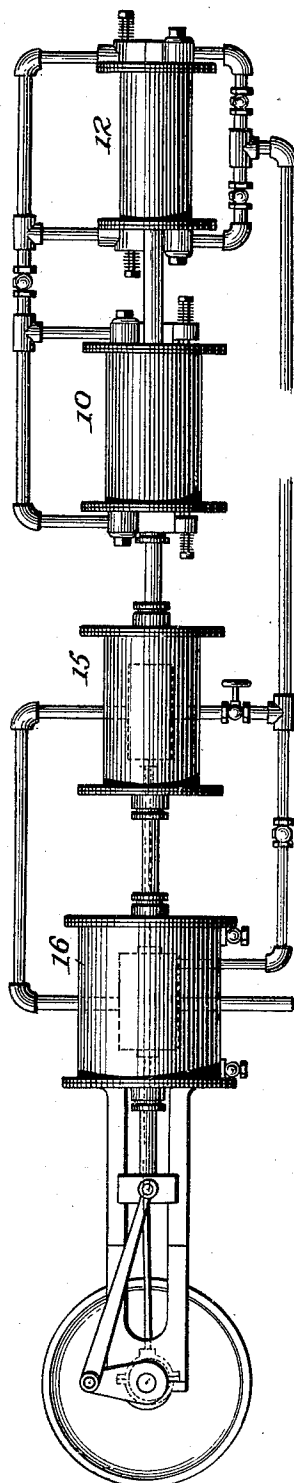
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3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

SAMUEL J. WEBB, OF MINDEN, LOUISIANA.

HOT-AIR LOCOMOTIVE.

997,878.

Specification of Letters Patent. Patented July 11, 1911.

Application filed January 23, 1902. Serial No. 90,923.

To all whom it may concern:

Be it known that I, SAMUEL J. WEBB, a citizen of the United States, residing at Minden, in the parish of Webster and State of Louisiana, have invented certain new and useful Improvements in Hot-Air Locomotives, of which the following is a specification.

My invention relates to locomotives actuated by compressed air and consists of means for heating and compressing the air constructed and arranged as fully set forth hereinafter and as illustrated in the accompanying drawing, in which—

Figure 1 is a longitudinal sectional elevation of a locomotive with my improvement; Fig. 2, an end elevation of the heater and air receptacles and connections and support; Fig. 3, a longitudinal section of the engine shown in Fig. 1; Fig. 4, a side elevation of another form of engine for using the air expansively.

The locomotive is provided with a suitable frame supporting wheels and cab of any desired construction and arrangement. Upon the frame are also arranged preferably at each side a motor and an air compressor operated therefrom. The motor and air compressor may each be single operating, as shown in Figs. 1 and 3, or they may each be compound, as shown in Fig. 4. As shown, the motor has a cylinder, piston and piston rod, as has also the compressor, and these are so arranged as to drive the wheels from the reciprocation of the piston as in any ordinary locomotive engine.

The cylinder of the compressor J has at each end an inlet port to which is adapted a spring seated valve 7 and an outlet port to which is adapted a spring seated valve 8 and the motor engine K operates under the pressure of the gases, whether single or compound, in the same manner as ordinary single or compound steam engines. Combined with these parts and occupying the body of the locomotive is a heater L of any suitable character, which is the means of heating the air that passes from the compressor to the motor engine. This heater may be of any desired character but preferably is in the form of a heat reservoir, as for instance, a body of material capable of absorbing a large amount of heat and of retaining the same and of imparting it to the air conducted in proximity thereto and is also of such

character that it may be heated from a source outside of the locomotive itself, so that the latter is provided with no heater or means of combustion. The preferred character of heat reservoir is a tank 3 provided with tubes 4 extending through end plates 5 arranged within the ends of the tank so as to leave chambers *a a*, the chambers and interiors of the pipes 4 being in the line of the conduit between the compressor and the motor, and the space outside the pipes 4 being filled with water at a high temperature and pressure. The diameter of the motor cylinder is considerably in excess of that of the compressor cylinder, and the air from the compressor passing through the conduit to the motor is heated and expanded to a high degree and acting upon the larger area of the motor piston serves to operate the motor in a manner to secure the desired compression of the air in the compressor.

The water may be deposited in a heated state in the tank 3, but, preferably, a pipe 6 extends through the tank to near the bottom thereof and can be coupled at the outer end with a steam pipe, which when the cock 2 is opened permits the passage of steam from any stationary source of supply to and through the water and the rapid heating of the latter. The pipe 6 may be perforated to facilitate the distribution of the steam. By thus providing means whereby the high degree of heat may be stored in the heater without providing the locomotive itself with any heating appliances, I am enabled to make use of the stored heat to expand the air, and use the expanded air as a motor fluid so that the apparatus is available in those cases where it would not be practicable to use a locomotive provided with a furnace or fire of any character, as for instance in connection with a locomotive used in the yards of cotton pressing establishments. In any case, however, the danger and other objections incident to carrying incandescent or lighted fuel upon the locomotive are avoided.

To avoid excessive pressure in the air channels, a by-pass is provided with a self regulating valve G, which may be set to lift at any desired pressure to permit the air from the compressor to pass back to the motor instead of going through the heater, which in a short time will reduce the pressure.

In order to have a reserved source of sup-

ply, I make use of one or more air receptacles F communicating with the air conduit. Preferably, these are so arranged as not to be heated so as to maintain a supply of cold air in constant connection with the conduit, whereby when the compressor is not in operation from any cause, the air may be supplied to the conduit to pass through the heater and operate the engine.

As shown there are two receptacles F, one on each side of the heater and each receptacle is connected to the circuit pipe D by a pipe *f* through which cold air is forced into the receptacle by the compressor. It will be evident that when this occurs, the resistance usually exerted by the compressor does not exist and for a short time the full pressure of the air is secured. To enable this to be effected at any time without putting the compressor itself out of operation, I provide an outlet port *y* in the circuit pipe D controlled by a hand valve 17 and place a check valve 9 between the receptacle F and the port *y*. When the port *y* is opened the back pressure will close the check valve, the air from the air receptacle will pass through pipes *f* and D to the heater and from the latter to the motor, while the air from the compressor will be discharged without material resistance through the port *y*, the closing of which will at once restore the normal operation of the compressor.

In Fig. 4, I have shown the construction of the motor and compressor in a compound engine where the high pressure cylinder 15 exhausts into the low pressure cylinder 16 and the main compressing cylinder 10 exhausts into the auxiliary reduced compressing cylinder 12 thereby securing the advantages of two compressions, and permitting also of a higher working pressure. Of course, between the outlet of the cylinder 12 and the inlet of the cylinder 15, the heater or heat reservoir is arranged, as before described.

I am aware that it has been proposed to drive locomotives by air heated and expanded by being passed through a body of hot water. This is attended with many objections which it is the purpose of my invention to avoid. It is desirable, of course, to maintain as great a body of material in the heater as possible and to avoid as far as possible the reduction of the heat in the heater. When the air is passed in contact with the parts of a heater without any diminution of the contents of the heater, as by the means which I have herein set forth, the reduction in the heating capacity of the heater is much less than when the air carries with it a portion of the heated material, as results when the air is passed through a body of water. Further, the water carried away with the air in such

cases is not conveyed in a cold state but passes from the heater in a highly heated condition, and the heat of the water thus discharged, and which is regularly discharged during the operation with a constant reduction of the volume of water in the heater, is lost and performs no function whatever. In proportion, as the volume of water in the heater is reduced the tendency for the heat of the water to become dissipated and lost is increased. When the body of the heated water is maintained intact throughout the whole operation and the air passes in contact only with the surfaces heated by the water, the heat of the water is imparted to the said surfaces and in turn to the air until the entire body is reduced to normal temperature, but no heat is lost except as it is thus imparted to the air and becomes available for expanding the latter and for motor purposes.

Without limiting myself to the precise construction described, I claim:

1. The combination in a locomotive, of a heat reservoir, means whereby to heat the reservoir by means outside the locomotive, a conduit for the passage of air arranged to be heated from said reservoir, a motor, an air compressor operated therefrom, and conduits arranged to conduct the compressed air from the compressor to said reservoir and from the latter to the motor, the said conduits being so constructed and arranged that the air passed through them does not come in contact with the heating material at any point, substantially as described.

2. The combination in a locomotive, of a motor, an air compressor, a reservoir provided with a heat retaining material and means for supplying said material in a heated condition from a source outside the locomotive, and means for passing the air from the compressor in proximity to the heating material in the reservoir and to the motor without coming in direct contact at any point with the heating material.

3. The combination in a locomotive, of a casing supporting a heat retaining liquid, means for supplying the heated liquid from a source outside the locomotive and means for passing air in contact with the parts of the casing heated by the liquid, a motor and an air compressor operated thereby, and pipes for conducting the heated air to the motor without permitting contact at any point with the heating medium, substantially as set forth.

4. The combination in a locomotive, of a casing supporting a body of heat retaining liquid, means for supplying said liquid in a heated condition from a source outside the locomotive, a conduit for conducting air in contact with said casing, a motor and an air compressor having high and low pressure cylinders, and means for supplying the

compressed air to said conduit and for conducting it from the latter to the high pressure cylinder, substantially as set forth.

5 5. The combination with the tank 3 and its heater pipes for the passage of air, and with the air compressor and motor, of a heat retaining material within the tank and in contact with the pipes, a pipe 6 extending into the tank and provided with means for
10 temporary connection with the steam pipe, and pipes connecting the heater pipes with the compressor and motor, constructed and arranged so that the air will remain out of contact with the heat retaining material,
15 substantially as set forth.

6. The combination with the motor, compressor and heater L and connections, of one or more air reservoirs connected to receive air from the compressor and to supply it
20 to the motor through the heater, without permitting contact at any point with the heating medium, substantially as set forth.

7. The combination with the motor, compressor and heater L and connections, of one or more air reservoirs connected to receive
25 air from the compressor and to supply it to the motor through the heater, an outlet y, connected with said compressor valve 17, controlling said outlet and check valve 9,
30 between said reservoir or reservoirs and said outlet, substantially as set forth.

8. The combination in a locomotive, of a motor, an air compressor, a heat reservoir,
35 an air storage tank independent of said reservoir, a pipe connection leading from the compressor through the heat reservoir to the motor, a branch pipe leading from said connection, between the compressor and heat reservoir, to said tank, a relief pipe also

leading from the said connection, a check 40 valve in the pipe connection between the branch and relief pipes, and a controlling valve in the relief pipe, substantially as set forth.

9. The combination in a locomotive, of a 45 heat reservoir, an air storage tank, a motor, an air compressor, an air conduit between the compressor and tank, an air conduit between the compressor and the motor, the latter conduit passing through the heat res- 50ervoir, and means for closing communication between the compressor and motor and establishing communication between said tank and motor, substantially as set forth.

10. The combination with the motor, com- 55pressor, heater L and connections leading through the heater directly from the compressor to the motor, of air reservoirs connected to receive air from the compressor and to deliver it to the motor when the com- 60pressor is cut off from the motor, substantially as set forth.

11. In a heat engine, the combination with a motor, of an air compressor, a chamber 65containing a heat retaining material, means for supplying said material in heated condition from a source outside the locomotive, and means for passing the air through said heat retaining material without direct con- 70tact with the said heat retaining material, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL J. WEBB.

Witnesses:

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W. CLARENCE DUVALL.